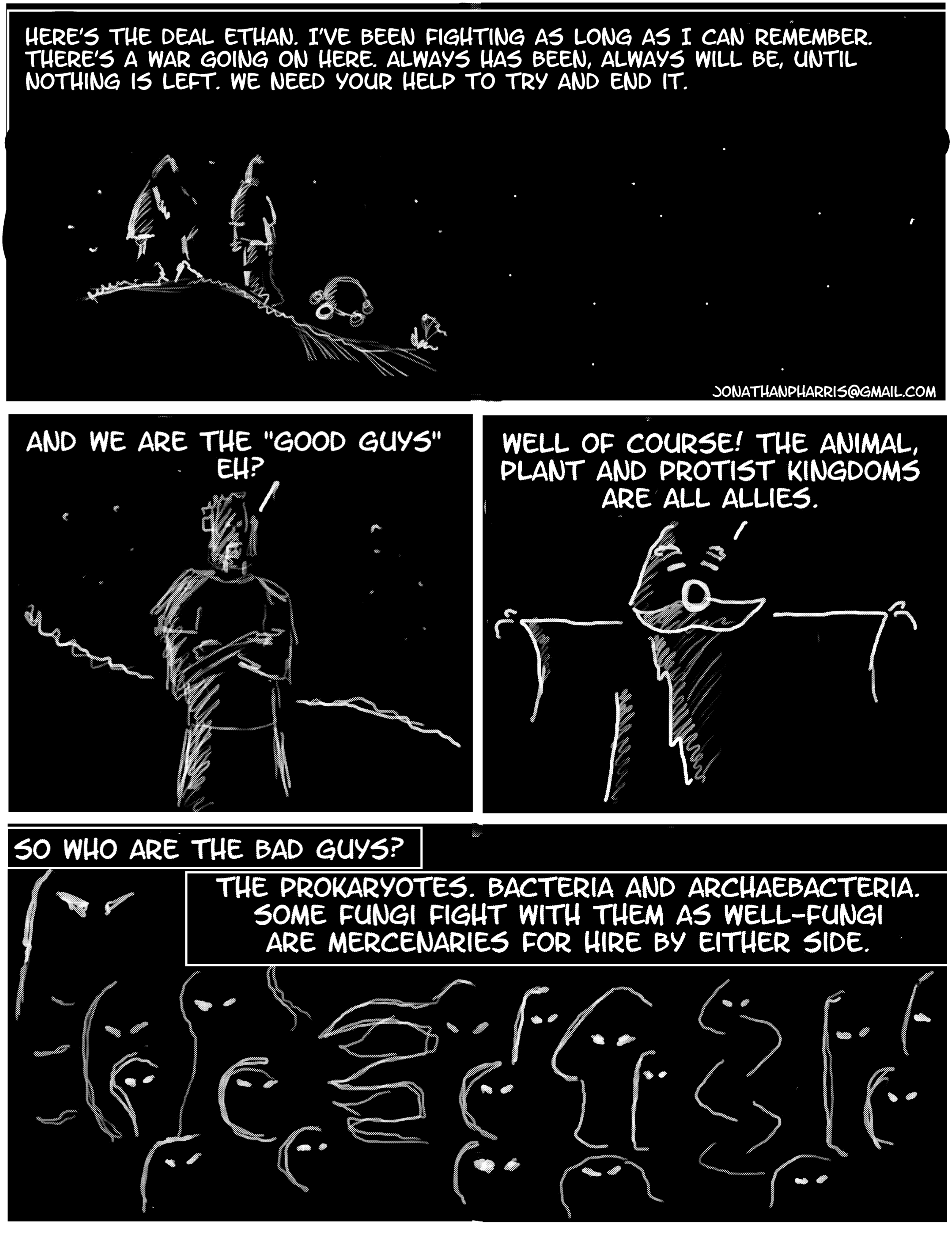
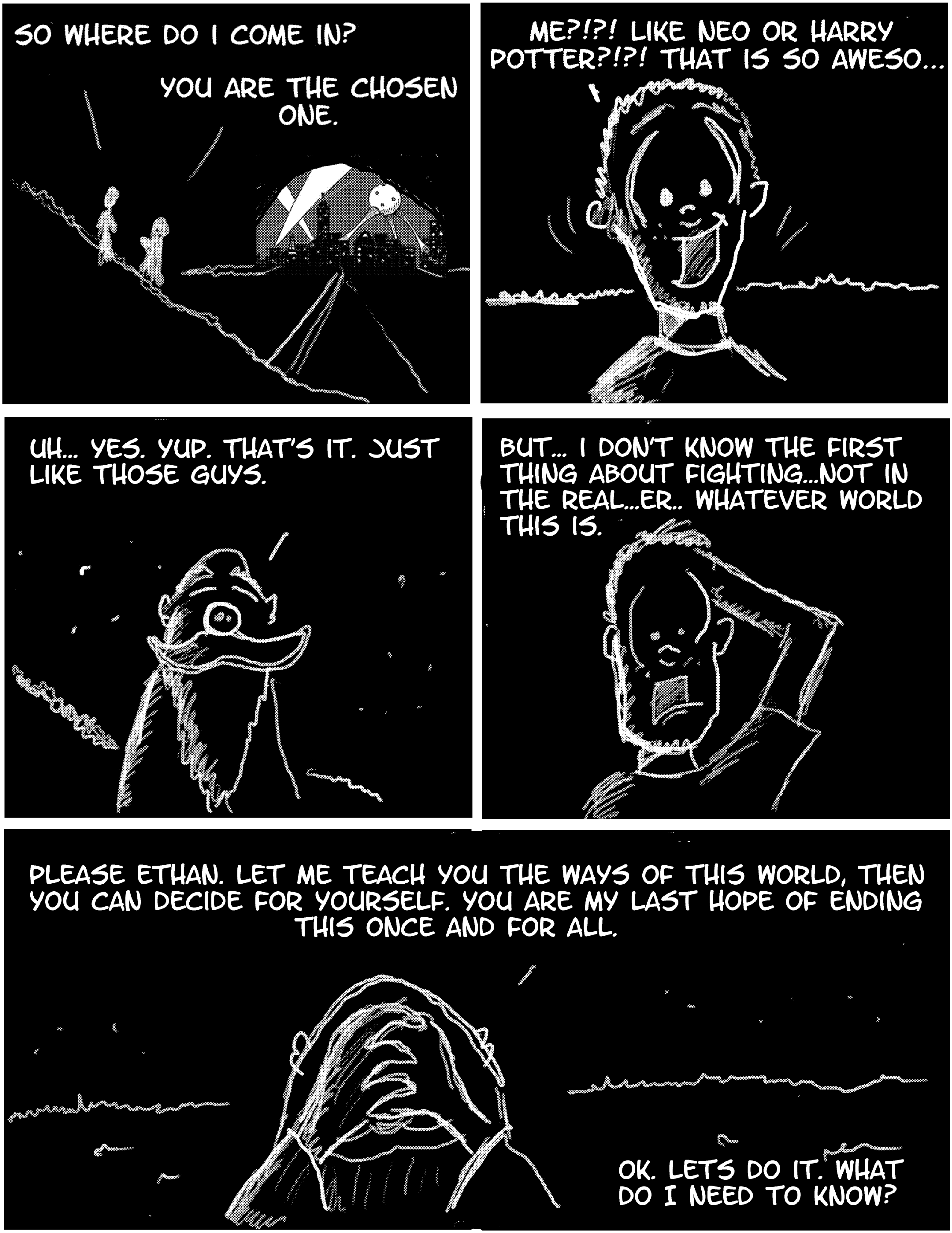
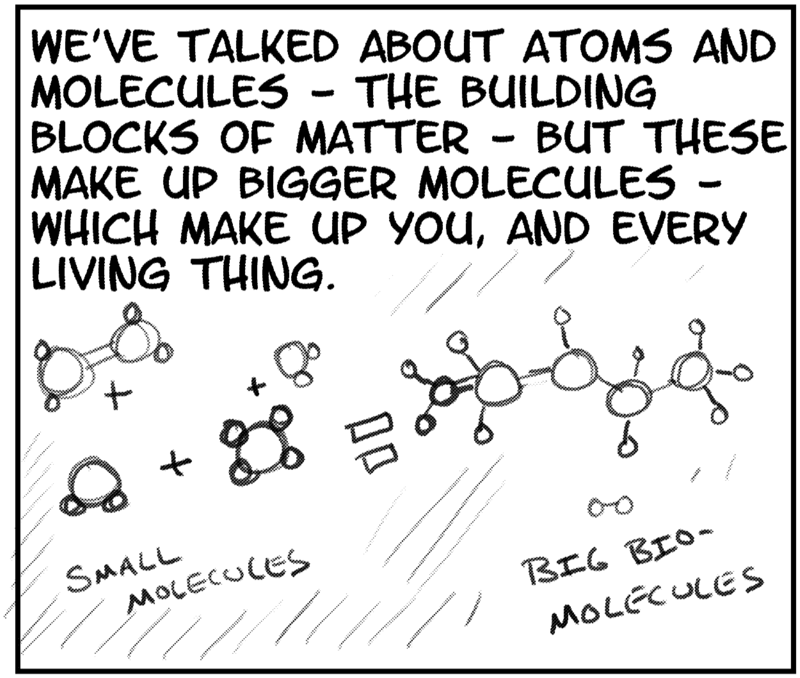
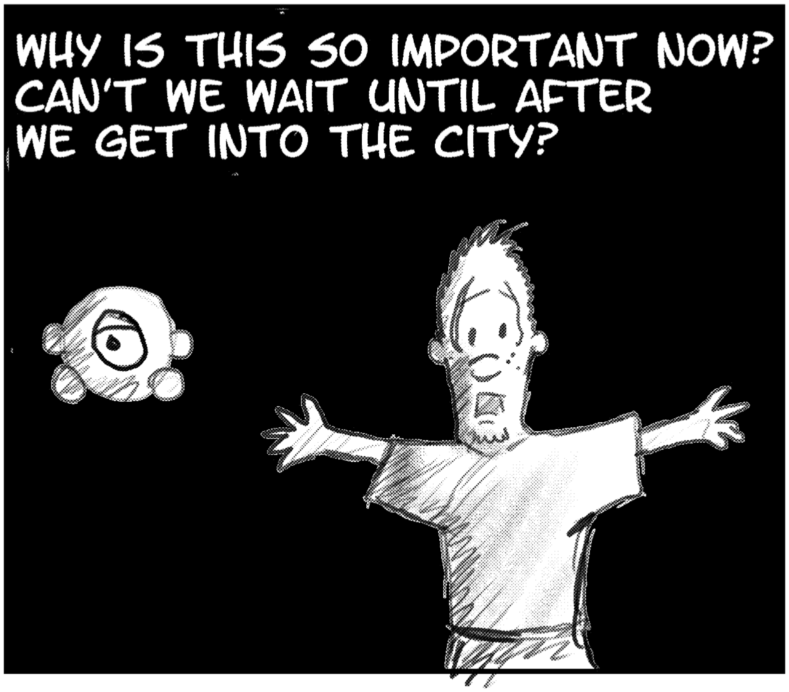

HERE'S THE DEAL ETHAN. I'VE BEEN FIGHTING AS LONG AS I CAN REMEMBER. THERE'S A WAR GOING ON HERE. ALWAYS HAS BEEN, ALWAYS WILL BE, UNTIL NOTHING IS LEFT. WE NEED YOUR HELP TO TRY AND END IT.
JONATHANPHARRIS@GMAIL.COM
AND WE ARE THE "GOOD GUYS" EH?
WELL OF COURSE! THE ANIMAL, PLANT AND PROTIST KINGDOMS ARE ALL ALLIES.
SO WHO ARE THE BAD GUYS?
THE PROKARYOTES. BACTERIA AND ARCHAEBACTERIA. SOME FUNGI FIGHT WITH THEM AS WELL–FUNGI ARE MERCENARIES FOR HIRE BY EITHER SIDE.

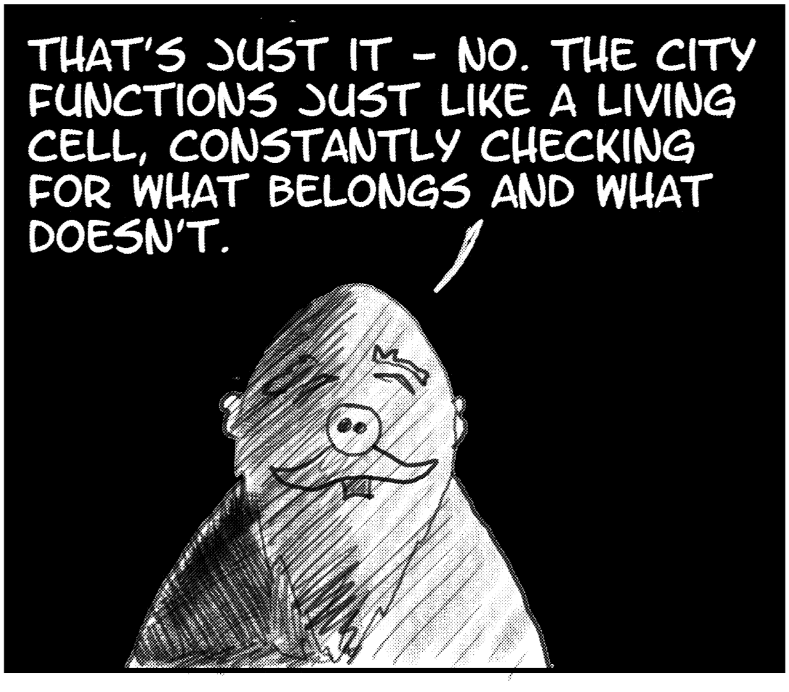

SO WHERE DO I COME IN?
YOU ARE THE CHOSEN ONE.
ME?!?! LIKE NEO OR HARRY POTTER?!?! THAT IS SO AWESO...
UH... YES. YUP. THAT'S IT. JUST LIKE THOSE GUYS.
BUT... I DON'T KNOW THE FIRST THING ABOUT FIGHTING...NOT IN THE REAL...ER.. WHATEVER WORLD THIS IS.
PLEASE ETHAN. LET ME TEACH YOU THE WAYS OF THIS WORLD, THEN YOU CAN DECIDE FOR YOURSELF. YOU ARE MY LAST HOPE OF ENDING THIS ONCE AND FOR ALL.
OK. LETS DO IT. WHAT DO I NEED TO KNOW?

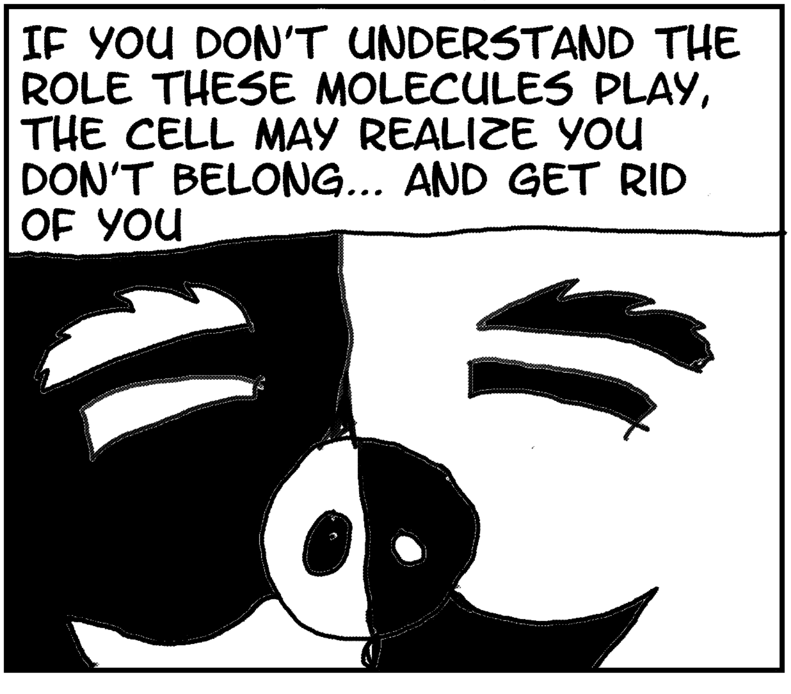
EXCELLENT. BEFORE WE HEAD INTO THE CITY THERE IS ONE OTHER CONCEPT YOU NEED TO UNDERSTAND.

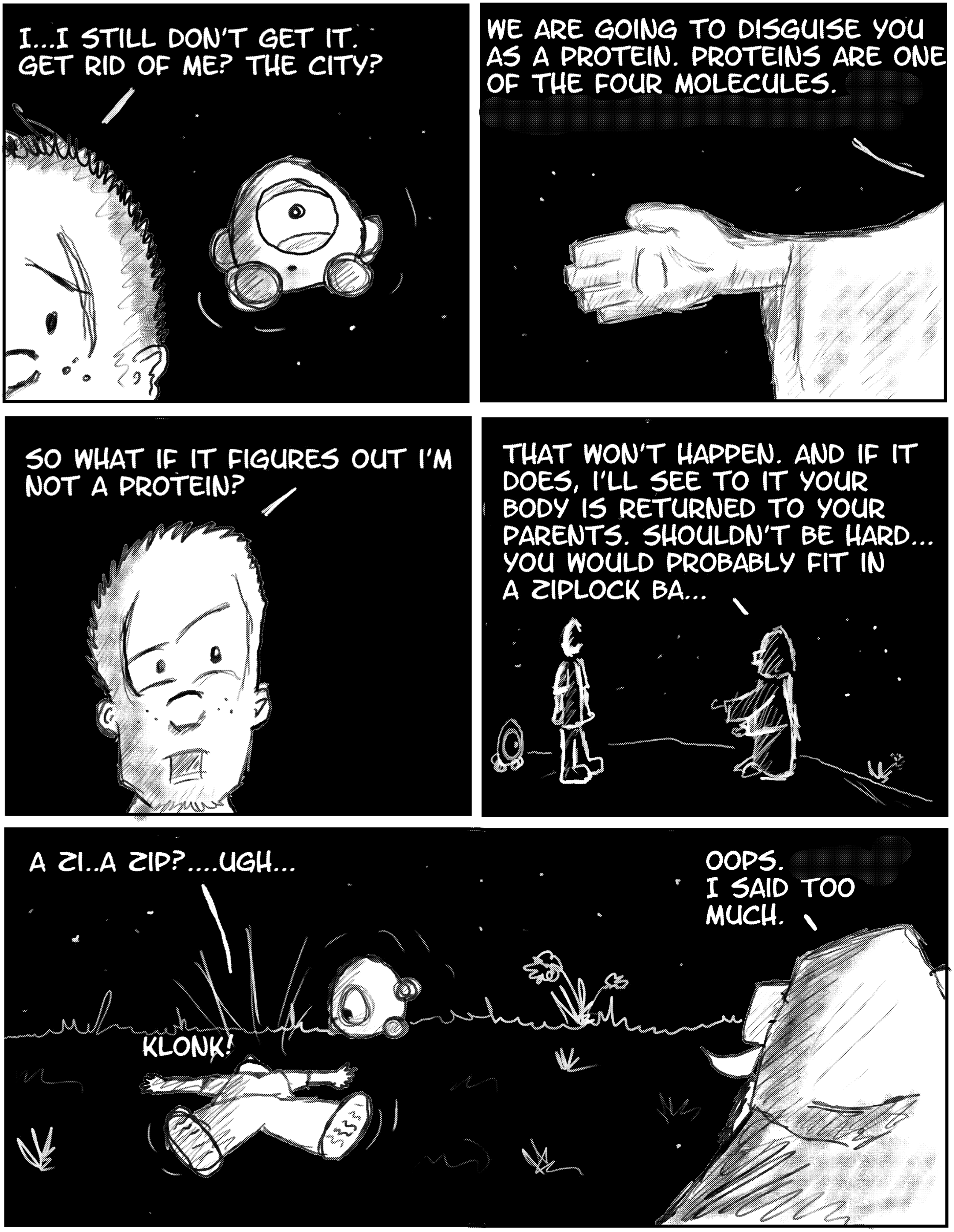

WE'VE TALKED ABOUT ATOMS AND MOLECULES - THE BUILDING BLOCKS OF MATTER - BUT THESE MAKE UP BIGGER MOLECULES - WHICH MAKE UP YOU, AND EVERY LIVING THING.
SMALL MOLECULES
BIG BIO-MOLECULES

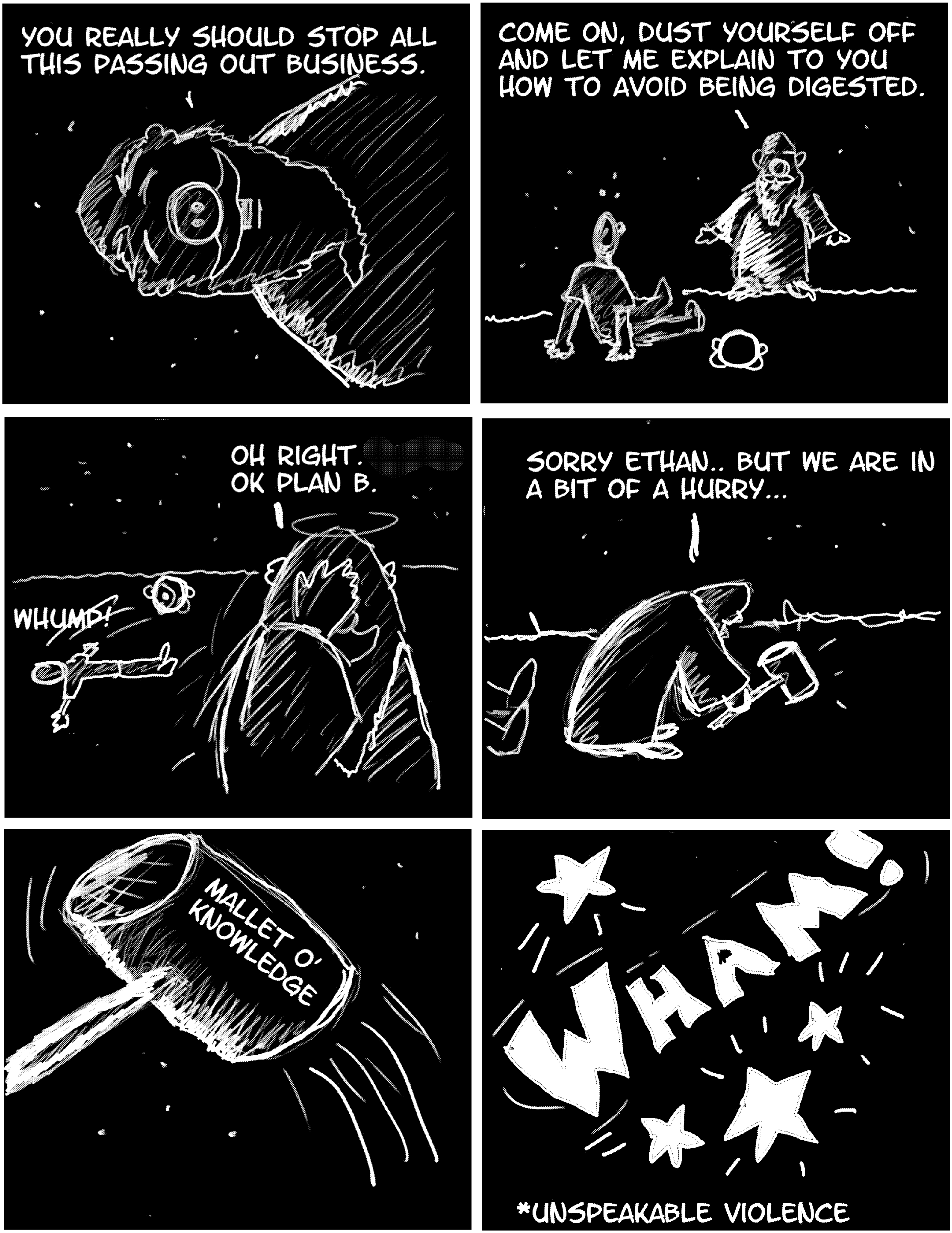
THERE ARE FOUR TYPES OF BIOMOLECULES, OR MOLECULES THAT OCCUR IN LIVING THINGS.


WHY IS THIS SO IMPORTANT NOW? CAN'T WE WAIT UNTIL AFTER WE GET INTO THE CITY?


THAT'S JUST IT - NO. THE CITY FUNCTIONS JUST LIKE A LIVING CELL, CONSTANTLY CHECKING FOR WHAT BELONGS AND WHAT DOESN'T.


IF YOU DON'T UNDERSTAND THE ROLE THESE MOLECULES PLAY, THE CELL MAY REALIZE YOU DON'T BELONG... AND GET RID OF YOU


I...I STILL DON'T GET IT. GET RID OF ME? THE CITY?
WE ARE GOING TO DISGUISE YOU AS A PROTEIN. PROTEINS ARE ONE OF THE FOUR MOLECULES. [redacted]
SO WHAT IF IT FIGURES OUT I'M NOT A PROTEIN?
THAT WON'T HAPPEN. AND IF IT DOES, I'LL SEE TO IT YOUR BODY IS RETURNED TO YOUR PARENTS. SHOULDN'T BE HARD... YOU WOULD PROBABLY FIT IN A ZIPLOCK BA...
A ZI..A ZIP?....UGH...
KLONK!
OOPS. [redacted] I SAID TOO MUCH.


YOU REALLY SHOULD STOP ALL THIS PASSING OUT BUSINESS.
COME ON, DUST YOURSELF OFF AND LET ME EXPLAIN TO YOU HOW TO AVOID BEING DIGESTED.
OH RIGHT. [redacted]
OK PLAN B.
WHUMP!
SORRY ETHAN.. BUT WE ARE IN A BIT OF A HURRY...
MALLET O' KNOWLEDGE
WHAM!
*UNSPEAKABLE VIOLENCE

HI THERE ETHAN. I'M YOUR CONCUSSED BRAIN. I'LL BE TEACHING YOU ABOUT THE 4 BIOLOGICAL MOLECULES, OR MACROMOLECULES.

CARBOHYDRATES

CARBOHYDRATES ARE THE ENERGY STORAGE OF CELLS. ESSENTIALLY, ALL CARBOHYDRATES ARE DIFFERENT FORMS OF SUGAR.

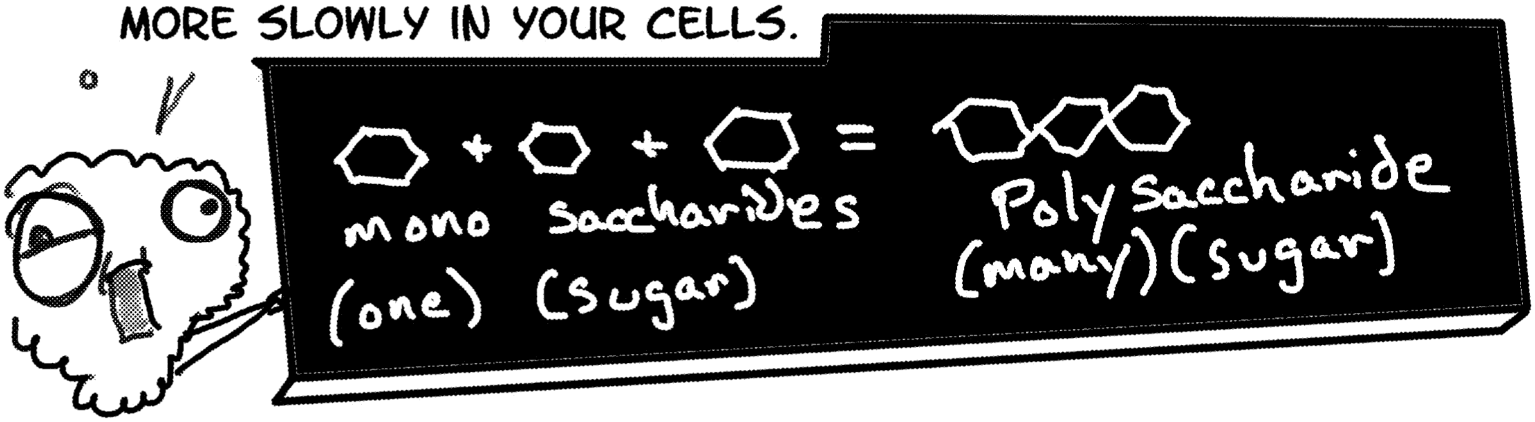
SOME FORMS ARE VERY SIMPLE AND SMALL, LIKE GLUCOSE.

GLUCOSE IS LIKE KINDLING FOR A FIRE, IT BURNS VERY EASILY AND QUICKLY INSIDE YOUR CELLS. GOOD, QUICK ENERGY.

NOM NOM NOM
THIS SHAPE MEANS SIMPLE SUGAR

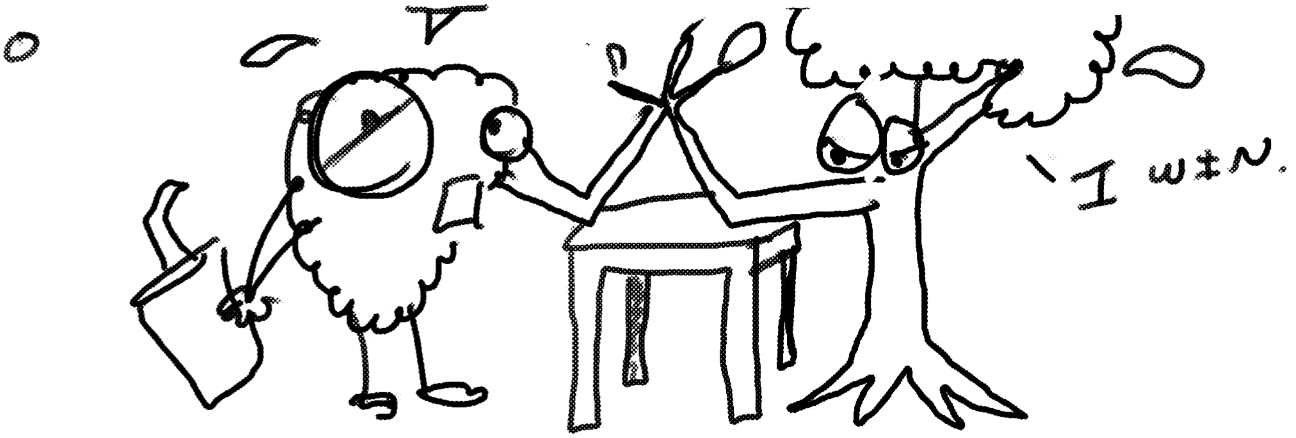
JONATHANPHARRIS@GMAIL.COM

OTHER CARBOHYDRATES ARE MORE COMPLEX- LONGER CHAINS OF SUGAR. SOME OF THESE ARE USED FOR LONGER TERM ENERGY STORAGE- LIKE STARCH. STARCHES GIVE YOU MORE LASTING ENERGY THAN SIMPLE SUGAR BECAUSE IT BURNS MORE SLOWLY IN YOUR CELLS.



THIS IS WHY ITS A GOOD IDEA TO EAT STARCHES A LONG TIME BEFORE AN ATHLETIC EVENT. IT'S LONGER LASTING ENERGY, RATHER THAN A QUICK SUGAR HIGH FROM SIMPLE SUGARS.

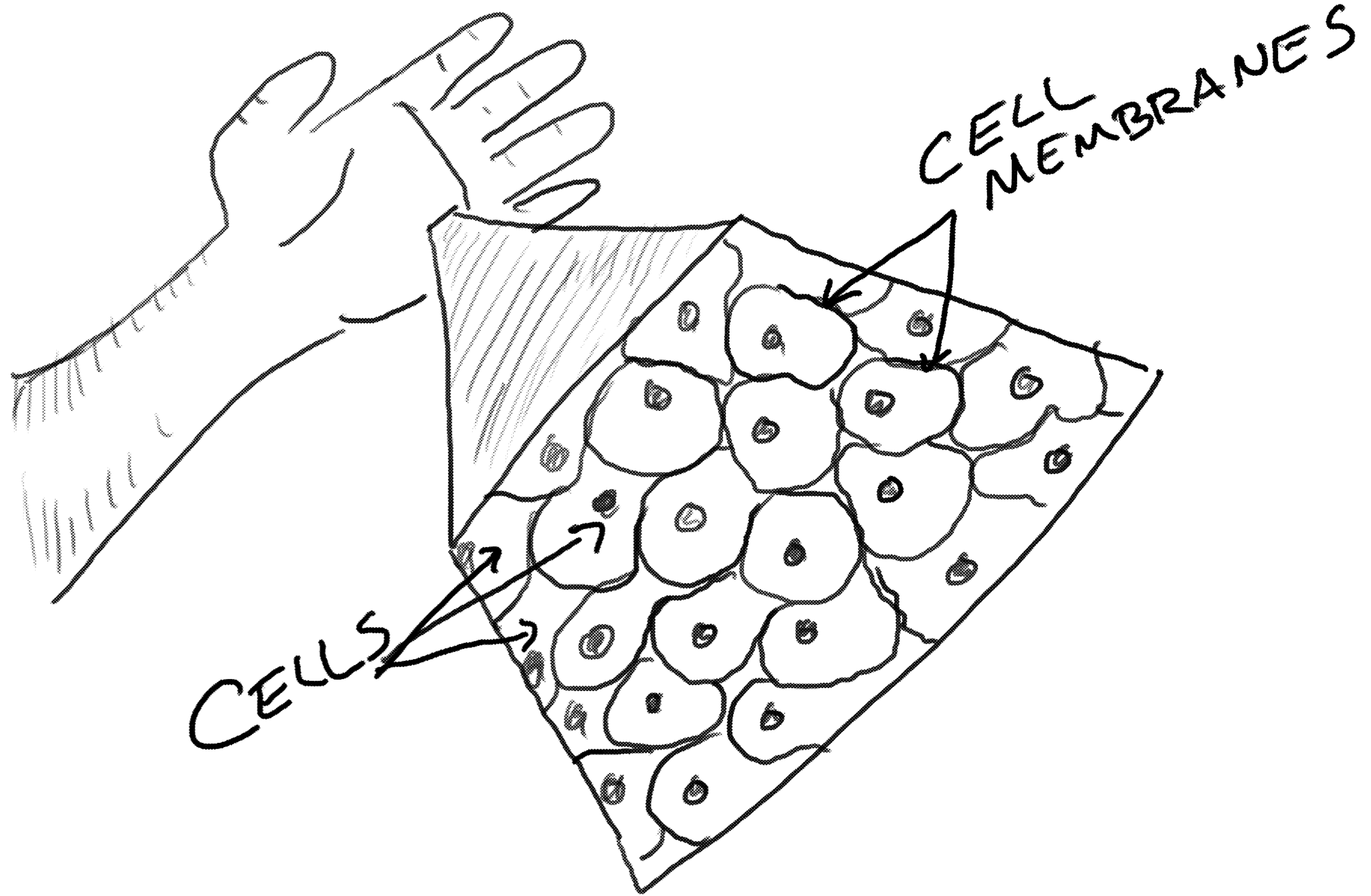
HOWEVER, NOT ALL CARBOHYDRATES ARE BURNED FOR ENERGY. PLANTS ARE ABLE TO STAND UPRIGHT WITHOUT ANY BONES BECAUSE THEY CAN WEAVE TOGETHER SIMPLE SUGARS INTO A LONG CHAIN CALLED CELLULOSE. THIS IS WRAPPED AROUND EVERY ONE OF THEIR CELLS TO PROVIDE SUPPORT, MAKING THEM RIGID.



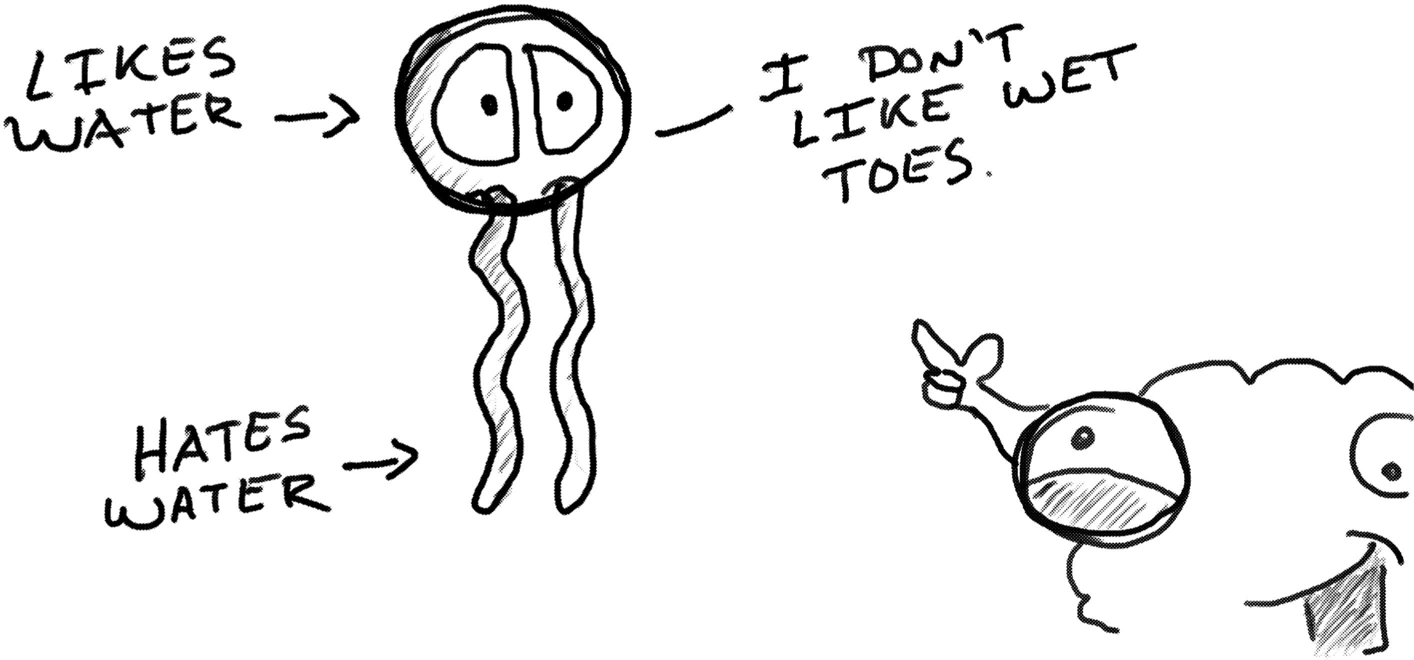
THE NEXT IMPORTANT BIOMOLECULE: LIPIDS

TYPES OF LIPIDS INCLUDE FATS, OILS AND WAXES.
LIPIDS ARE HYDROPHOBIC – THAT MEANS AFRAID OF WATER. THAT'S WHY OIL AND WATER DON'T MIX.

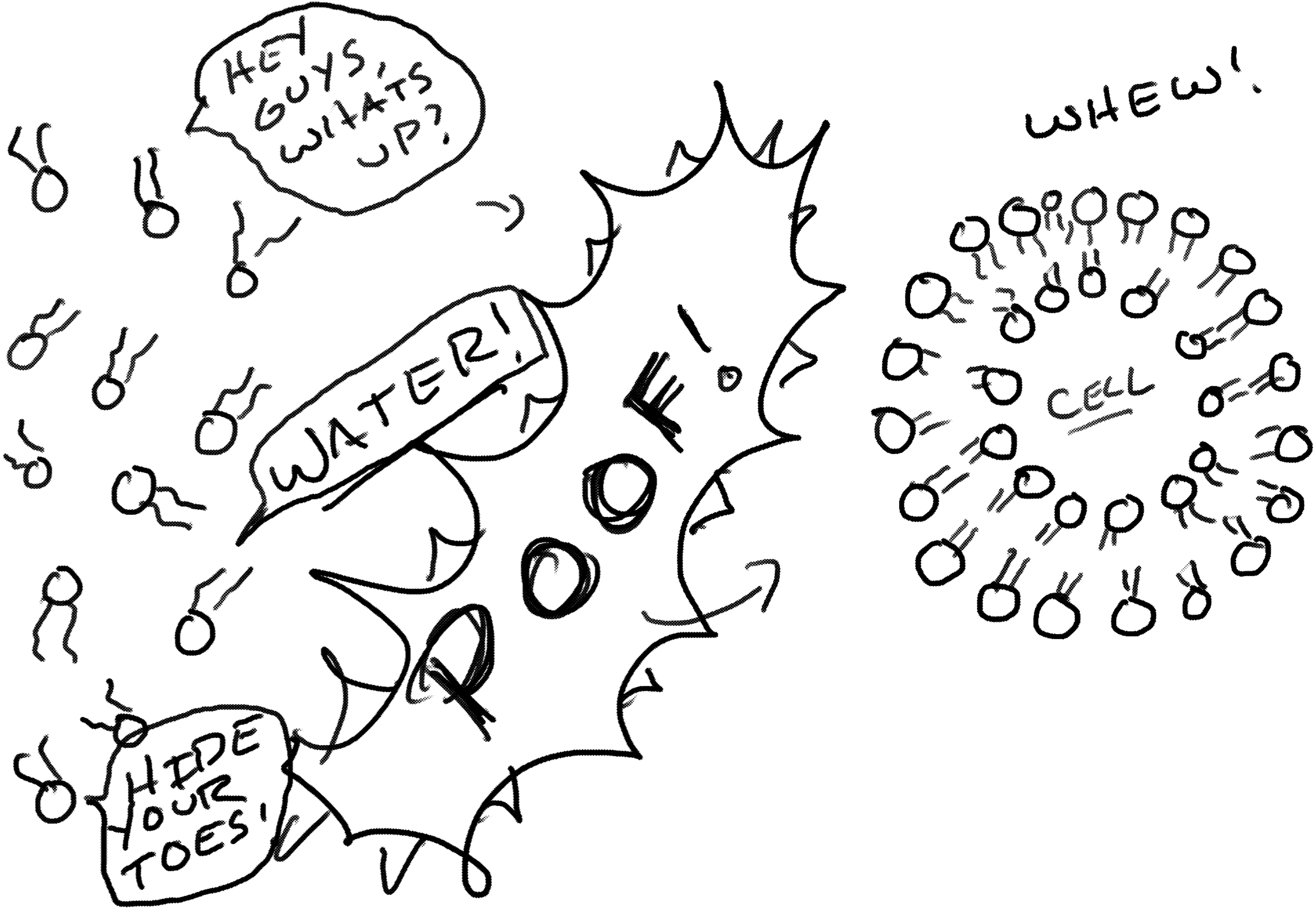
LIPIDS DO A BUNCH OF THINGS FOR YOUR CELLS. THEY MAKE UP SOME HORMONES, VARIOUS TYPES OF STORAGE MOLECULES AND INSULATION. HOWEVER, THEIR MOST IMPORTANT ROLE IS AS THE BARRIER THAT MAKES UP YOUR CELL MEMBRANES, OR THE PROTECTIVE COAT AROUND EVERY SINGLE ONE OF YOUR CELLS.



THESE CELL MEMBRANE-LIPIDS ARE CALLED PHOSPHOLIPIDS, AND THEY HAVE A HYDROPHOBIC AND A HYDROPHILIC (WATER LOVING) PART.

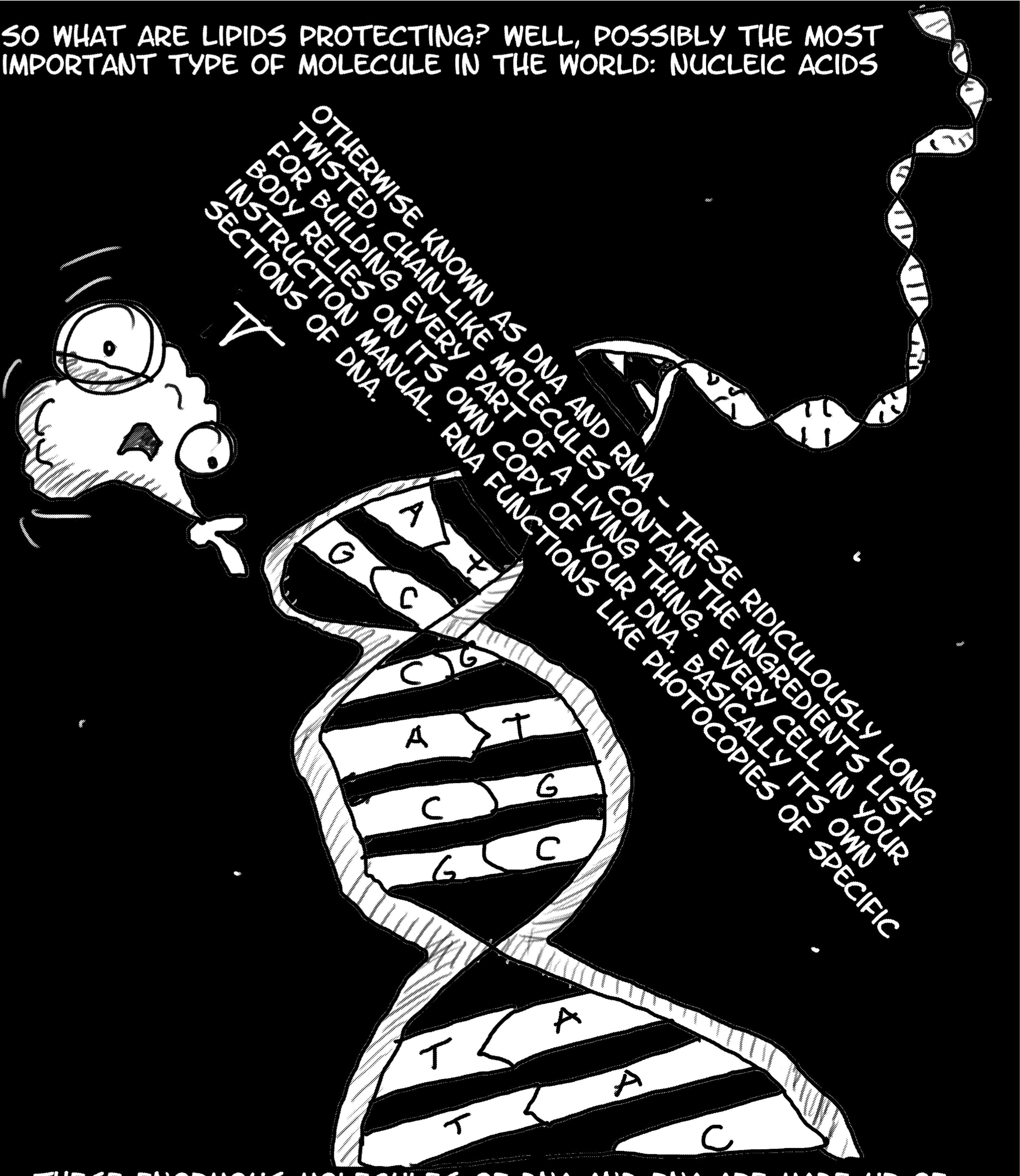


BECAUSE OF THIS UNIQUE STRUCTURE, THEY NATURALLY BUNCH TOGETHER TO FORM DOUBLE LAYERED BUBBLES - CELL MEMBRANES, THAT HELP REGULATE WHAT CAN COME IN AND GO OUT OF A CELL.


HEY GUYS, WHATS UP?
WATER!
HIDE OUR TOES!
WHEW!
CELL

SO WHAT ARE LIPIDS PROTECTING? WELL, POSSIBLY THE MOST IMPORTANT TYPE OF MOLECULE IN THE WORLD: NUCLEIC ACIDS

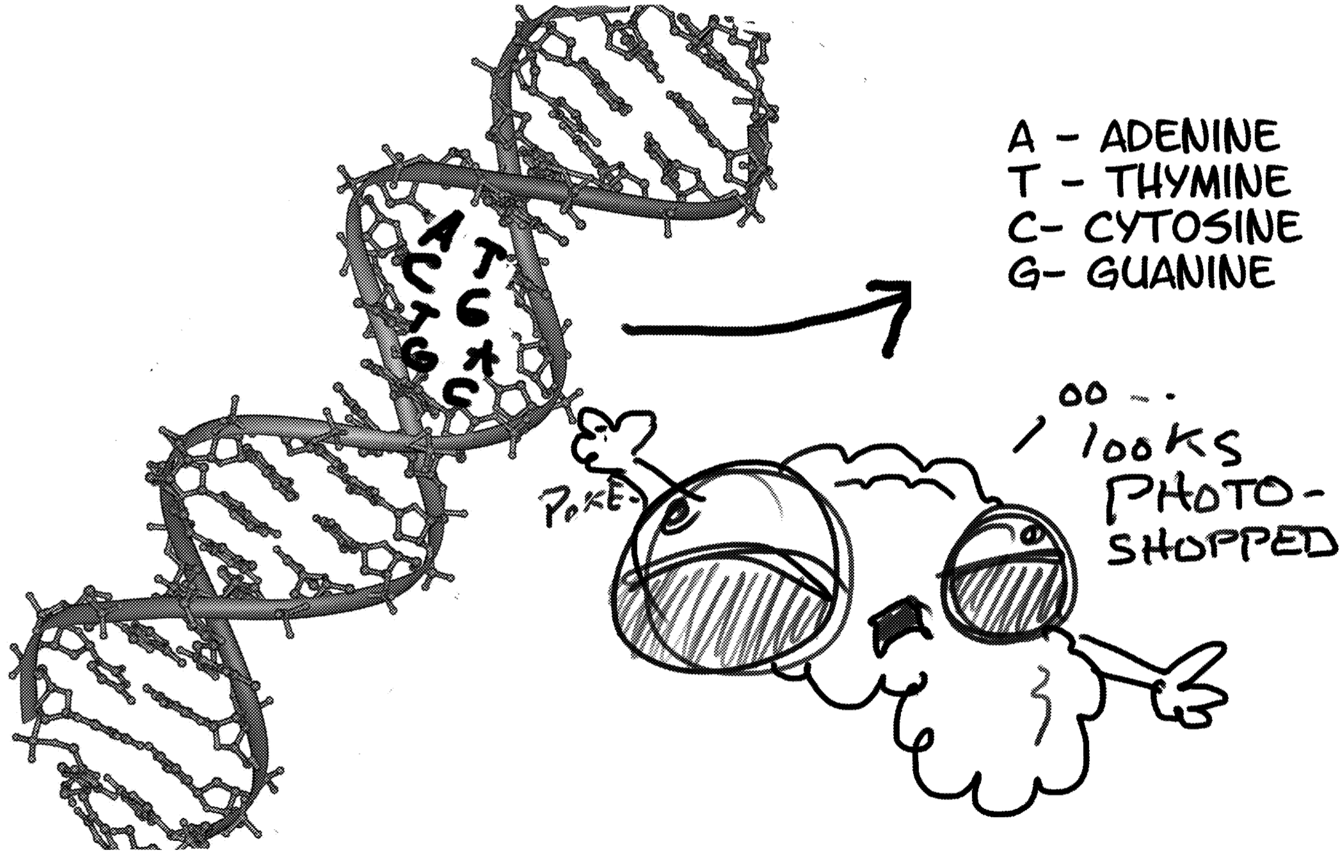
OTHERWISE KNOWN AS DNA AND RNA - THESE RIDICULOUSLY LONG, TWISTED, CHAIN-LIKE MOLECULES CONTAIN THE INGREDIENTS LIST FOR BUILDING EVERY PART OF A LIVING THING. EVERY CELL IN YOUR BODY RELIES ON ITS OWN COPY OF YOUR DNA. BASICALLY ITS OWN INSTRUCTION MANUAL. RNA FUNCTIONS LIKE PHOTOCOPIES OF SPECIFIC SECTIONS OF DNA.



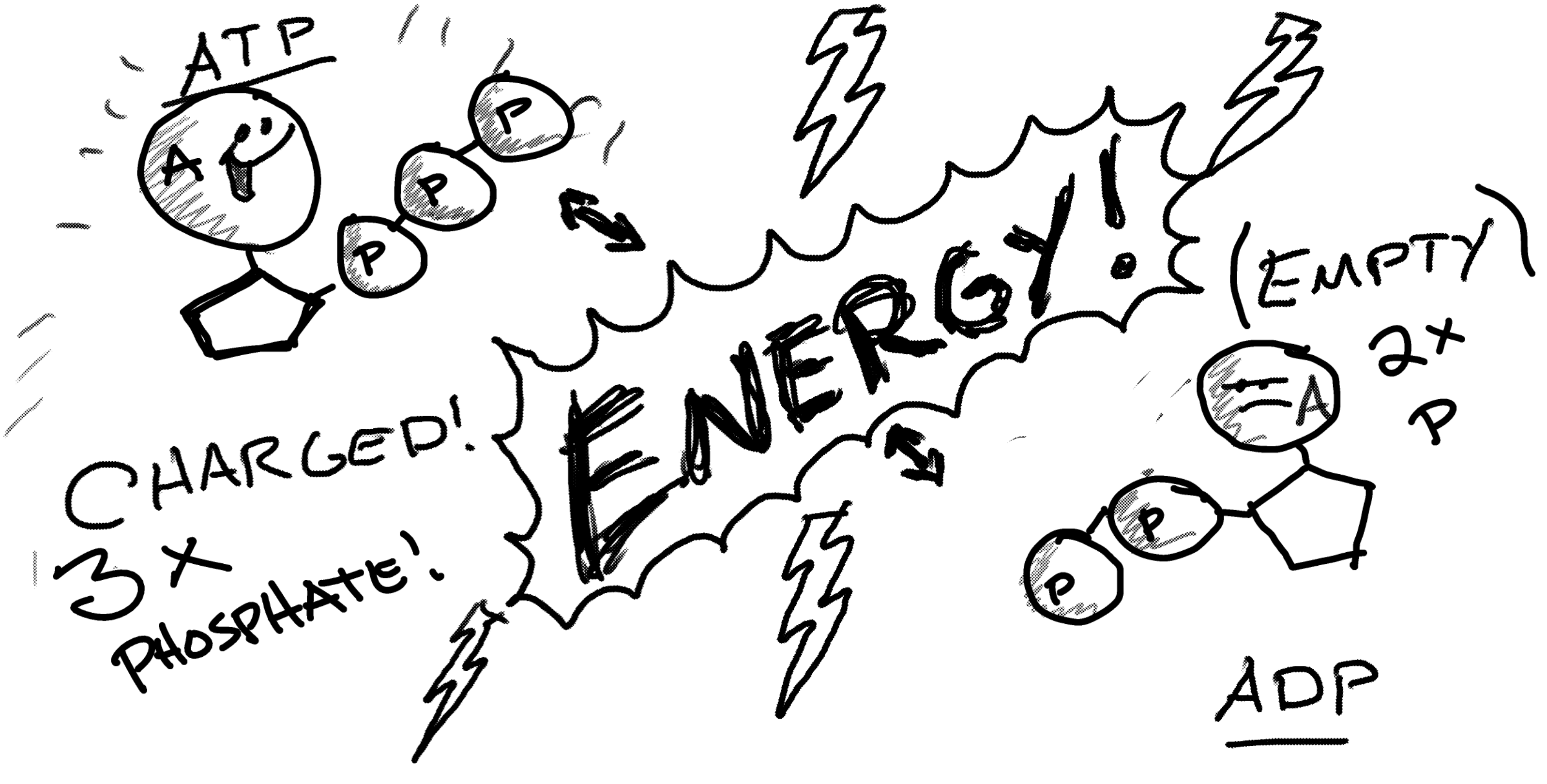
THESE ENORMOUS MOLECULES OF DNA AND RNA ARE MADE UP OF JUST 4 DIFFERENT MOLECULES, CALLED NUCLEOTIDES. CHANGE THE POSITION OF JUST A FEW OF THESE NUCLEOTIDES AND YOU COULD BE A GENIUS, OR GET CANCER BEFORE YOUR THIRD BIRTHDAY.

JONATHANPHARRIS@GMAIL.COM

THESE FOUR DIFFERENT MOLECULES: A, T, C AND G FOR SHORT ENCODE ALL THE INFORMATION TO MAKE YOU. SINCE DNA IS DOUBLE STRANDED, THE OPPOSITE STRAND HAS THE COMPLEMENTARY MOLECULE, SO "A" ALWAYS STICKS TO "T" AND "C" TO "G"

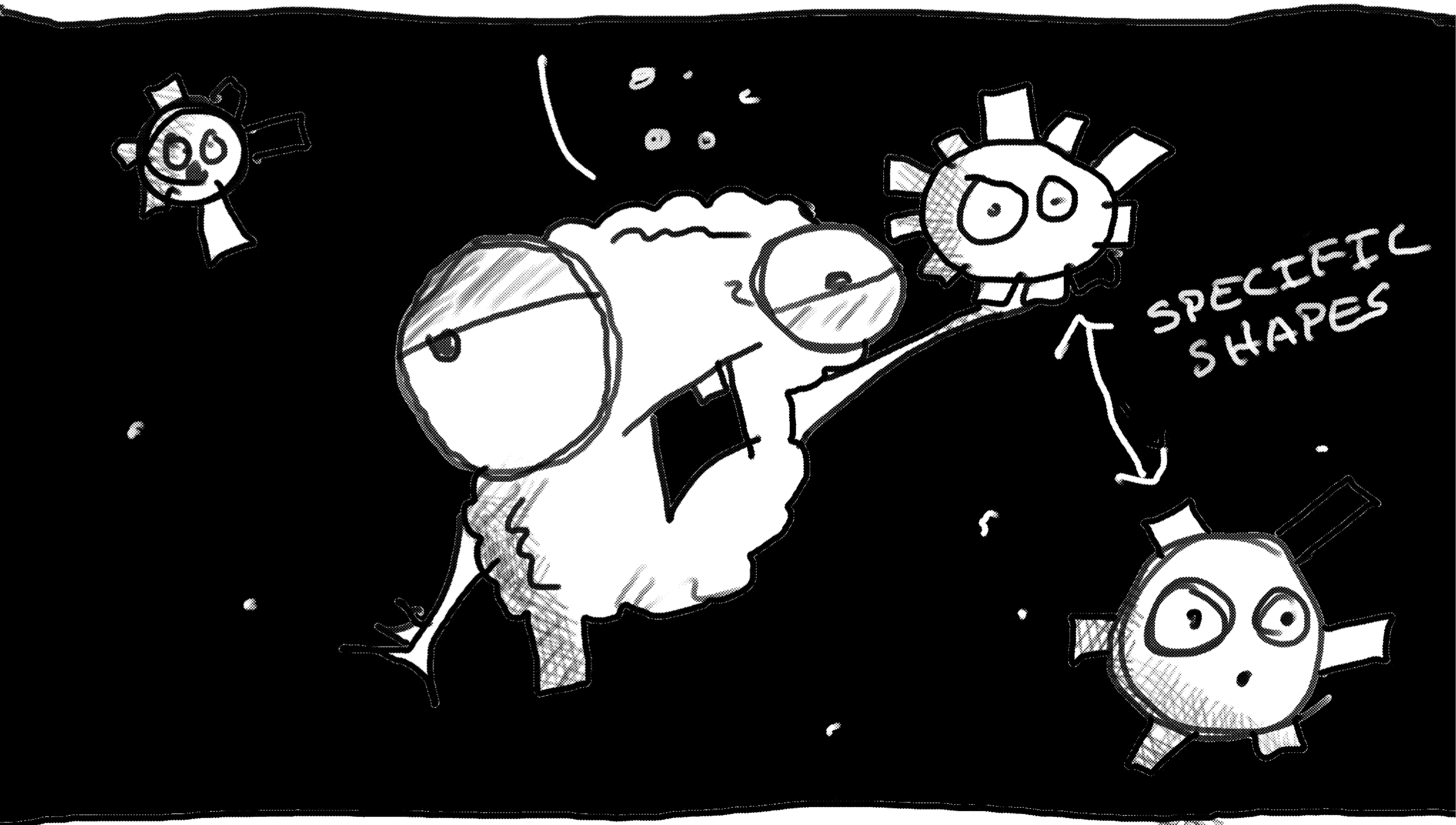


ANOTHER NUCLEIC ACID THAT IS ALMOST AS IMPORTANT AS DNA AND RNA IS ATP - THIS IS THE ENERGY "CURRENCY" OF THE CELL. LIKE LITTLE RECHARGABLE BATTERIES, MOLECULES OF ATP STORE SMALL UNITS OF ENERGY FOR THE CELL TO USE LATER.

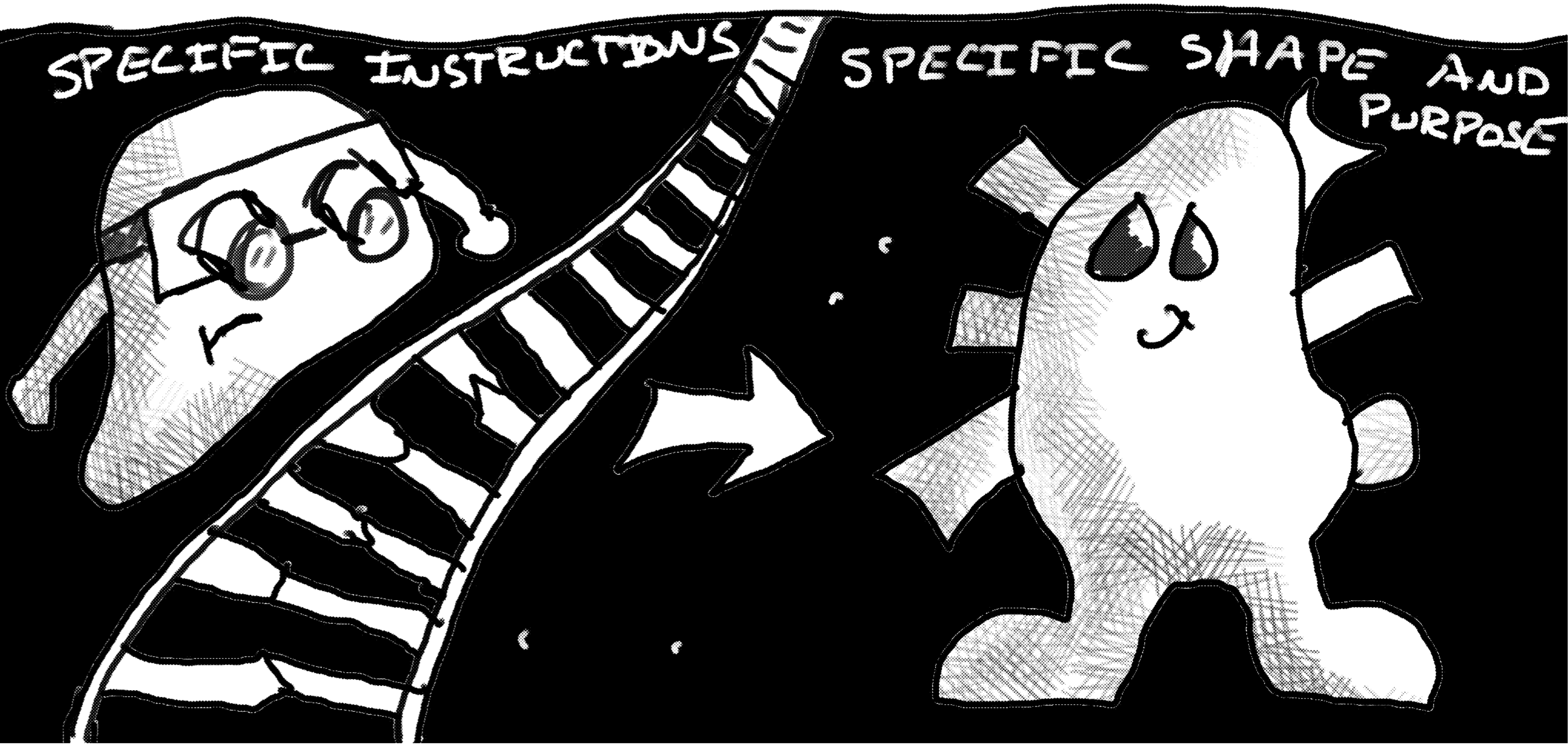


THE LAST OF THE 4 BIOMOLECULES IS PROTEIN

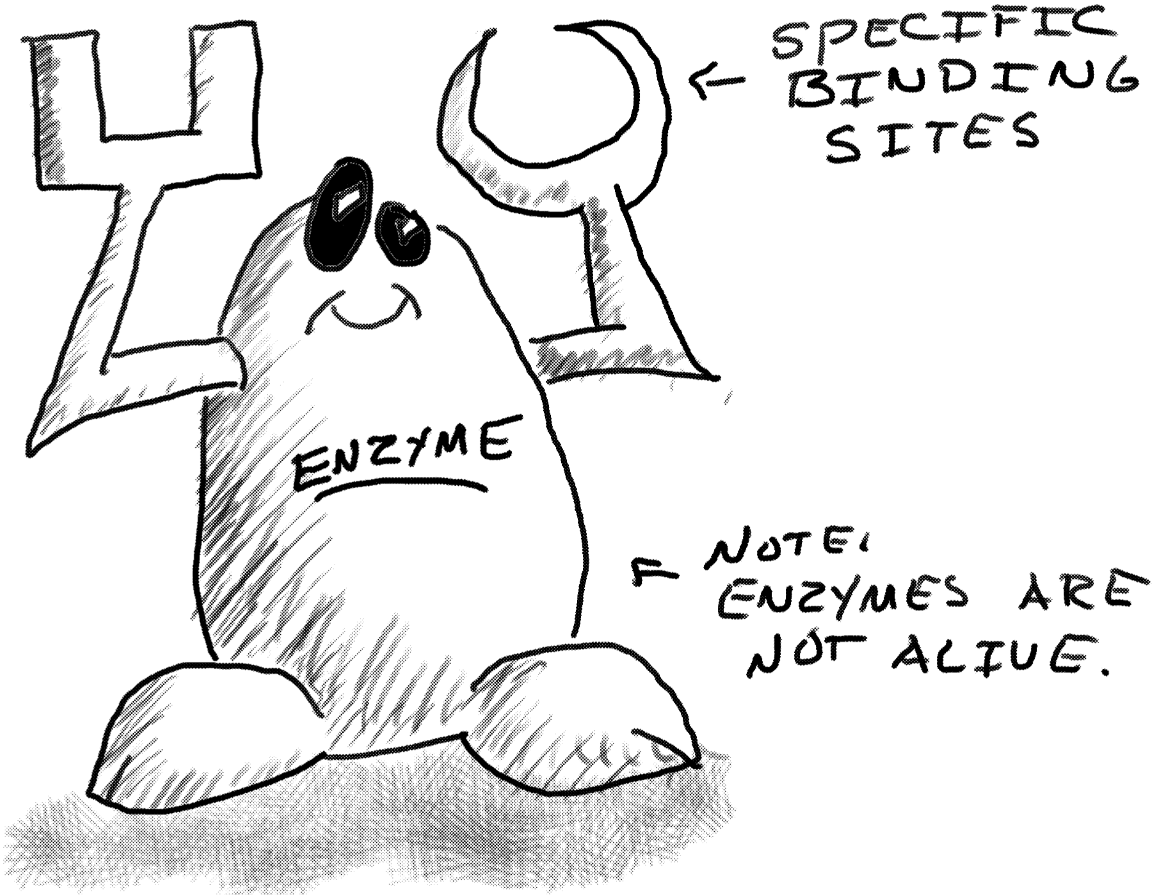
PROTEINS ARE EVERYTHING TO A LIVING THING. ALTHOUGH THE DNA CONTAINS THE PARTS LIST FOR BUILDING A LIVING THING, THE PROTEINS ARE THE GOAL. PROTEINS ARE THE MACHINERY, THE (NON-LIVING) WORKERS OF THE CELLS. THEY ARE WHAT MAKE YOU TICK.



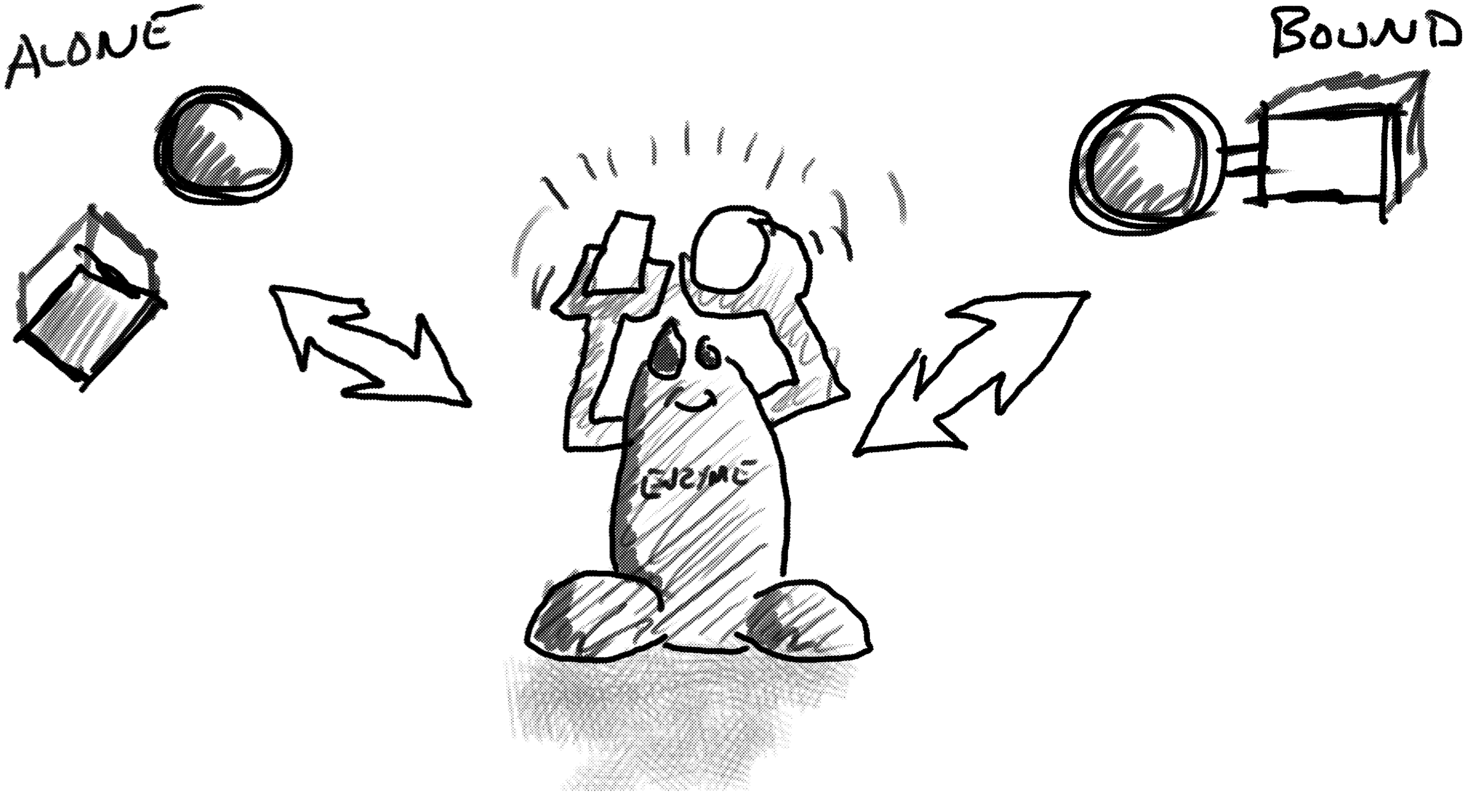
THEY ARE CAREFULLY ASSEMBLED FROM SMALLER MOLECULES CALLED AMINO ACIDS, USING THE INSTRUCTIONS FROM THE DNA AND RNA.



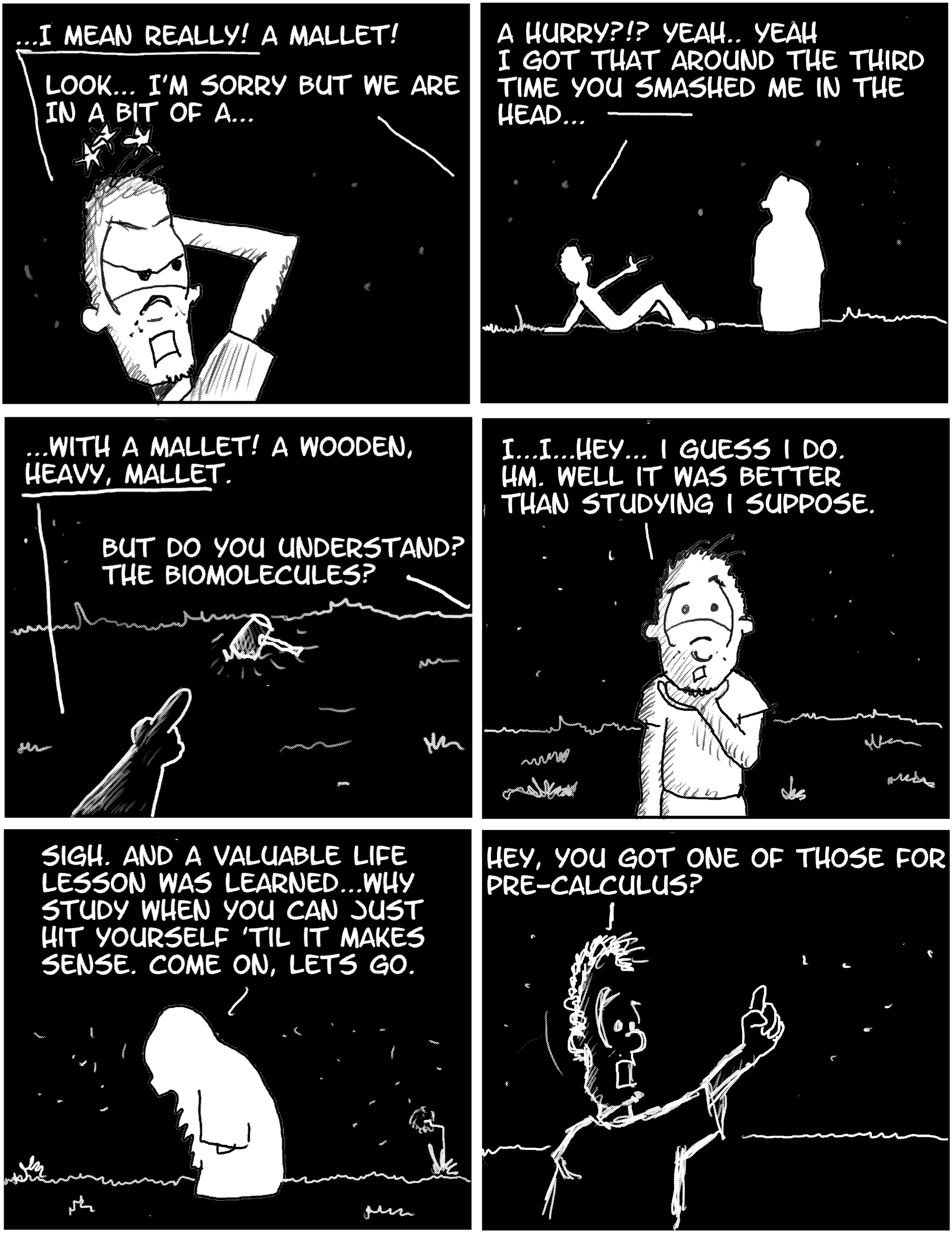
ONE OF THE MORE IMPORTANT TYPES OF PROTEINS ARE ENZYMES. ENZYMES HAVE ONE SPECIFIC JOB THEY DO VERY WELL, OVER AND OVER AGAIN, WITHOUT GETTING TIRED OR USED UP.



THESE ENZYMES USUALLY EITHER TAKE A LARGER MOLECULE AND BREAK IT APART, OR TAKE TWO SMALLER MOLECULES AND STICK THEM TOGETHER. THE COLLECTION OF THE MILLIONS OF THESE SIMPLE REACTIONS IN YOUR BODY MAKES LIFE POSSIBLE.



NOW MAKE SURE YOU REMEMBER THESE FOUR MOLECULES ETHAN. THESE WILL KEEP POPPIN' UP ALL OVER THE PLACE IN YOUR STUDIES, SO ITS EASIER IF YOU LEARN 'EM NOW. OOPS, LOOKS LIKE YOU MIGHT BE WAKING UP NOW. DON'T FORGET TO EAT! I'M A HUNGRY ORGAN!


...I MEAN REALLY! A MALLET!
LOOK... I'M SORRY BUT WE ARE IN A BIT OF A...
A HURRY?!? YEAH.. YEAH I GOT THAT AROUND THE THIRD TIME YOU SMASHED ME IN THE HEAD...
...WITH A MALLET! A WOODEN, HEAVY, MALLET.
BUT DO YOU UNDERSTAND? THE BIOMOLECULES?
I...I...HEY... I GUESS I DO. HM. WELL IT WAS BETTER THAN STUDYING I SUPPOSE.
SIGH. AND A VALUABLE LIFE LESSON WAS LEARNED...WHY STUDY WHEN YOU CAN JUST HIT YOURSELF 'TIL IT MAKES SENSE. COME ON, LETS GO.
HEY, YOU GOT ONE OF THOSE FOR PRE-CALCULUS?

REVIEW CHAPTER 3

1. COME UP WITH A MEAL OR SNACK THAT WOULD HAVE AT LEAST 1 EXAMPLE OF EACH OF THE 4 TYPES OF BIOMOLECULES. MAKE SURE YOU SPECIFY WHAT FOOD CONTAINS WHICH BIOMOLECULE!

2. FOR THE FOLLOWING, CLASSIFY EACH AS MOSTLY:
A) CARBOHYDRATE
B) LIPID
C) NUCLEIC ACID
D) PROTEIN

3.____ AN ENZYME IN YOUR STOMACH
4.____ CELLULOSE IN PLANTS, MADE FROM LOTS OF GLUCOSE
5.____ THE OILS SECRETED BY YOUR SKIN
6.____ A LEAN PIECE OF MEAT
7.____ DNA
8.____ ATP
9.____ SUGAR-FREE JELLO (GELATIN)
10.____ RNA

11. WHAT IS UNUSUAL ABOUT PHOSPHOLIPIDS? WHERE ARE THEY USUALLY FOUND?